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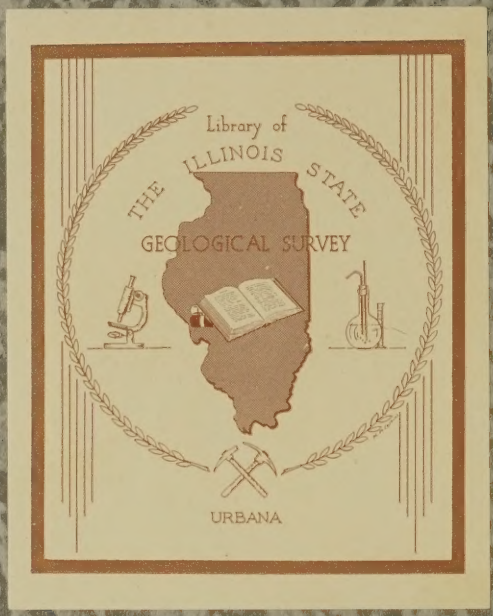
ILLINOIS. DEPT. OF PUBLIC WORKS AND BUILDINGS. DIV. OF WATERWAYS

Survey Report for Flood Control, Rock Creek, Whiteside County, 1946.



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STATE OF ILLINOIS

DWIGHT H. GREEN, Governor

SURVEY REPORT

FOR

FLOOD CONTROL

ROCK CREEK, WHITESIDE COUNTY

1946

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DEPARTMENT OF PUBLIC WORKS AND BUILDINGS

DIVISION OF WATERWAYS

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STATE OF ILLINOIS

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SURVEY REPORT

FOR

FLOOD CONTROL

ROCK CREEK, WHITESIDE COUNTY

1946

DEPARTMENT OF PUBLIC WORKS AND BUILDINGS

DIVISION OF WATERWAYS

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SYLLABUS

The reach of Rock Creek covered by this report extends from the city of Morrison to its confluence with Rock River. The entire reach is located in Whiteside County.

The areas adjacent to Rock Creek, which are subject to overflow, are productive agricultural lands and 90 per cent of the annual flood damages are suffered by agricultural interests. Lands subject to overflow are flat and the width varies from 1500 feet to 13,000 feet.

Three plans were studied for reducing flood damages on Rock Creek, namely, plans A, B and C. Plan C was the only plan found to be economically justified and is therefore recommended.

1. **Authority.** This report is authorized under provisions of "AN ACT in relation to the regulation of the rivers, lakes and streams of the State of Illinois," approved June 10, 1911. (Chapter 19, Sections 52-78 inclusive, Illinois Revised Statutes.)

2. **Prior Reports.** The U. S. Engineer Department considered a dam and reservoir on Rock Creek near Morrison at an estimated cost in 1940 of $700,500. This plan was not found to be economically justified.

In 1945, the U. S. Engineer Department considered a continuous levee extending along the right bank of Rock River from high ground near Lyndon, at Rock River Mile 52.3, to the present mouth of Rock Creek at Mile 41.4, and thence extending upstream 8 miles along the left bank of Rock Creek to high ground near Fenton. The estimated first cost of this construction was $226,075 and the estimated annual cost was $10,759. At a meeting held with the landowners to consider this proposed levee the landowners voted unanimously against the proposed plan. The objections to the plan were: first, the high cost of the protection; second, some of the farms along Rock River would be cut in two by the levee; and third, the land outside the levee would be adversely affected.

3. **Description.** Rock Creek rises near Lanark in Carroll County and flows in a southerly direction about 29 miles by stream channel to the gaging station near Morrison in Whiteside County, thence continues southerly about 21 miles by stream channel to the Rock River. The mouth of Rock Creek is 41.4 miles above the mouth of Rock River. The drainage area is 246 square miles. The principal tributaries are Otter Creek, Little Spring Creek, Little Rock Creek and French Creek. (See Sheets No. 1 and 2)

The Rock Creek watershed lies in a glaciated area. The maximum elevation above mean sea level is 940 feet near Lanark. Other elevations are 607 feet above mean sea level at the gaging station near Morrison and 574 feet above mean sea level at the mouth of Rock Creek. The watershed is 31 miles long and has a maximum width of 11 miles.

The reach of Rock Creek considered in this report is from the mouth to the Chicago and Northwestern Railway bridge near the city of Morrison, a distance by stream channel of approximately 18 miles. The flood plain is broad and consists of flat agricultural land with the principal soil type being brown silt loam. This reach of Rock Creek is very tortuous with the exception of a section approximately 1.75 miles in length beginning at the mouth and extending to the vicinity of Fenton. This section was straightened in 1879 and was cleared of trees in 1940 by the Civilian Conservation Corps. The existing channel has an average cross sectional area of 500 square feet and at bankfull stage will carry approximately 700 cubic feet per second.

At present the channel is constricted at numerous places by log jams and various other kinds of debris. Trees, which vary in size from 4 inches to 48 inches in diameter, cover both right and left banks and extend to the edge of water at normal stage.

4. **Maps and Photographs.** The following tabulation lists the various maps and aerial photographs available for Rock Creek watershed.

Type	Prepared By	Date	Scale	Contour Interval	Area Covered
Topographic	U. S. Geological Survey Morrison Quadrangle Cordova Quadrangle	 1940 1910	 1:62,500 1:125,000	20′	Entire Area
Illinois Transportation	Federal Works Agency Public Roads Adm.	1944	1″=1 mile	None	Entire Area
Aerial Photographs	AAA Dept. of Agr.	1939	Approx. 1:20,000	None	Entire Area
Plan and Profile	State of Illinois Dept. of Public Works and Bldgs. Div. of Waterways	1946	1″=400′	5′	Entire Area
Drainage Basin	U. S. Geological Survey	1946	As Shown	None	Entire Area

5. **Economic Development.** Morrison, with a population of 3200, is the county seat of Whiteside County and the largest city in the watershed. Other nearby trading centers and their populations are: Erie 1052, Lyndon 476, and Prophetstown 1469. The principal businesses in the towns are those relating to agriculture. The area is traversed by state, county and township roads and is served by two railroads, the Chicago Burlington and Quincy and the Chicago Northwestern. In the area covered by this report, the density of rural population is about 15 persons per square mile. The principal crops are corn, oats, hay and dairy products, and the average value of the land was about $200 per acre in 1946.

6. **Precipitation.** Observation stations operated by the U. S. Weather Bureau in the vicinity of the Rock Creek watershed are listed in the following tabulation.

Station	Period of Record	Average Annual Rainfall—Inches	Remarks
Mt. Carroll	1889 to date	34.27	Outside Basin
Lanark	1890-1915*, 1940 to date	33.73	In Basin
Morrison	1895 to date	34.55	In Basin
Dixon	1889 to date	33.92	Outside Basin
Fulton	*1935 to date	33.48	Outside Basin
Oregon	1906*-1940 to date	33.55	Outside Basin
Prophetstown	*1940 to date	34.50	Outside Basin

* Recording Gage.

At Lanark a notable storm occurred September 2, 1942. Transposition of this storm over the Rock Creek basin to obtain the maximum precipitation over the basin would produce a flood that could

reasonably be expected to occur once in fifty years based on data from U. S. Department of Agriculture Miscellaneous Publication No. 204 by David L. Yarnell. Depth-area curves indicate that the rainfall over the Rock Creek basin would have been 3.77 inches for the first 6 hours. Using an actual rainfall distribution graph for this storm and the U. S. Geological Survey discharge distribution graph, the peak discharge at Morrison would have been about 18,500 c.f.s.

7. **Runoff.** The U. S. Geological Survey and the U. S. Engineer Department have cooperatively maintained stream-gaging stations on Rock Creek near Coleta, near Morrison, and at Morrison.

PERIOD OF RECORD

Near Coleta.....1939-1942
At Morrison.....1940-1942
Near Morrison.....1942 to date

During the period of record the maximum observed discharge was 4180 c.f.s., occurring December 27, 1942 at a stage of 14.66 feet at the station near Morrison. The minimum observed discharge at the same station was 9.5 c.f.s. and occurred December 2, 1942 at a stage of 2.2 feet.

8. **Floods.** Flow records for Rock Creek are available only for the period subsequent to 1940. Farmers who have lived in the community for the past 50 years stated that the most damaging floods occurred in February 1937, June 1937, January 1938 and June 1938. Pertinent data concerning damaging floods is tabulated as follows:

Year	Date	Peak Flood Discharge at Morrison*				
		Stage M. S. L.	Mean Day sec. ft.	Maximum Crest c. f. s.	Maximum c. f. s. per sq. mi.	Volume of Flood in Inches Runoff
1937	June 20-21	626.6	3000	6500	59.2	2.2
1937	February 20-21	624.7	**			
1938**	January 24-25	621.1	**			
1938	June 24-25	620.2	1110	2000	11.9	.75
1941	June 1-3	620.8	1250	2520	15.0	.91

* Discharge referred to gage at Morrison based on high water marks.
** Stage-discharge relation affected by ice.

The flood of June 1937 was the most damaging for which records are available, and occurred during the growing season. This flood inundated 8400 acres, of which 5400 acres were cultivated. The estimated damage, which includes damage to railroads, highways and utilities, was $100,000.

The floods of February 1937 and January 1938 caused flooding of farm land but damage was not great on account of the time of occurrence. The depth of flooding varied due to numerous ice jams. No estimate of damage was made.

The flood of June 1938 inundated 6000 acres, of which 3500 acres were under cultivation. The estimated damage was $10,000. The flood of June 1941 inundated 6500 acres, of which 4000 acres were under cultivation. The estimated damage was $15,000.

9. **Extent and Character of Flooded Area.** Flooded areas in the reach considered in this report are almost entirely rural in character, consisting of a broad flat valley which has a maximum width of three miles and a minimum width of one quarter mile. Flood damage is predominately agricultural and is composed of crop losses and damage to pastures and fences. The areas affected are highly productive, corn being the principal crop. Some damage occurs to highways, bridges, culverts and railroads.

From the mouth of Rock Creek to a point near Fenton, backwater from Rock River causes flooding of about 5000 acres. In general, flooding by Rock River occurs during January, February or March and, as this is outside the growing season, the damage is not great.

10. **Flood Damage.** The areas flooded and direct damages sustained were estimated in part from data furnished by the U. S. Engineer Department. The average annual damage for floods occurring in the growing season, May 1 to October 15, is $27,000.

11. **Existing Flood Control Project.** There is no authorized state or federal flood control project for Rock Creek.

12. **Improvements by Federal and Non-Federal Agencies.** No improvements of Rock Creek for flood control have been made by any federal or state agency except as noted above. Private levees have been constructed by individual landowners, affording protection for small cultivated areas. Available information indicates that these existing levees have not been overtopped. This system of levees was started in 1937 with additions being made up to 1940. (See Sheets No. 3, 4 and 5.)[1]

13. **Improvements Desired.** Local interests have requested that the channel be straightened and cleared of trees and log jams. In addition, it has been suggested that a system of levees be constructed to tie in with the existing levees.

14. **Surveys.** During 1937 the Division of Waterways made a survey of Rock Creek from a point approximately one mile north of Morrison to the mouth, a distance of some 21 miles. The stream and adjacent areas were mapped and stream cross sections were taken.

15. **Plan of Improvement.** Studies were made of flood conditions along Rock Creek and various plans of improvement were considered. Three plans of improvement, plans A, B and C, are discussed in this report. All distances are based on stationing along the existing channel, with station 0 + 00 at the mouth of Rock Creek.

Plan A. This plan of improvement consists of channel straightening and widening from the mouth of Rock Creek (station 0 + 00) to the Chicago and Northwestern Railway bridge near Morrison, Illinois

[1] Not printed with this report.

(station 952 + 80) to provide channel capacity up to 4000 c.f.s. This flow has an expected growing season frequency of once in 5 years.

From station 0 + 00 to station 726 + 70, the channel would be dredged to the following dimensions with alignment as shown on Sheets No. 3 to 8 inclusive.[1]

Bottom width	85 feet
Side slopes	3 to 1
Elevation of bottom at station 0 + 00	574.00 feet
Elevation of bottom at station 211 + 40	585.00 feet
Elevation of bottom at station 726 + 70	600.93 feet
Depth of channel (bankfull stage)	11.0 feet
Length of improved channel	52,260 feet
Length of existing channel	72,670 feet

From station 726 + 70 to station 952 + 80, the channel would be dredged to the following dimensions with alignment as shown on Sheets No. 3 to 8 inclusive.[1]

Bottom width	60 feet
Side slopes	3 to 1
Elevation of bottom at station 726 + 70	600.93 feet
Elevation of bottom at station 952 + 80	610.00 feet
Depth of channel (bankfull stage)	13.0 feet
Length of improved channel	17,620 feet
Length of existing channel	22,610 feet

The present bridge openings are considered adequate to pass the 4000 c.f.s. discharge after dredging of the channel.

Plan B. This plan of improvement consists of channel straightening, widening, and levee construction, from the mouth of Rock Creek at station 0 + 00 to the Chicago and Northwestern Railway bridge near Morrison at station 952 + 80, to provide channel capacity up to 9000 c.f.s. This flow has an expected growing season frequency of once in 10 years.

From station 0 + 00 to station 211 + 40, the channel would be dredged and a levee constructed along both banks with alignment as shown on Sheets No. 3 to 8 inclusive,[1] of the plans. The channel would be dredged to the following dimensions:

Bottom width	85 feet
Side slopes	3 to 1
Elevation of bottom at station 0 + 00	574.00 feet
Elevation of bottom at station 211 + 40	585.00 feet
Length of improved channel (same as existing)	21,140 feet

For details of levee construction see Sheet No. 9 of the plans.

From Station 211 + 40 to station 726 + 70, the channel would be dredged and a levee constructed along both banks with alignment as shown on Sheets No. 3 to 8 inclusive,[1] of the plans. The channel would be dredged to the following dimensions:

[1] Not printed with this report.

Bottom width	50 feet
Side slopes	3 to 1
Elevation of bottom at station 726 + 70	600.93 feet
Elevation of bottom at station 952 + 80	610.00 feet
Length of improved channel	31,120 feet
Length of existing channel	51,530 feet

For detail of levee construction see Sheet No. 9 of the plans.

The present bridge openings are considered adequate to pass the 9000 c.f.s. discharge after dredging of the channel.

PLAN C. This plan of improvement would consist of clearing and cleaning the present channel from the mouth of Rock Creek, station 0 + 00, to Chicago and Northwestern Railway bridge near Morrison, station 952 + 80. Clearing and cleaning would consist of removing from the present channel all vegetation, log jams and other debris. In addition the ground would be cleared of trees and brush for a distance of 30 feet landward from the top of each bank. This plan is based on providing a channel capacity of 900 c.f.s. This flow has an expected growing season frequency of once in 1.25 years.

16. **Estimates of Cost.**

PLAN A

CONSTRUCTION:		
Channel excavation, 2,500,000 c.y. at 35c		$ 875,000
Clearing, 244 acres at $150		36,600
		$ 911,600
Engineering and contingencies, 20%		182,320
		$ 1,093,920
Right of way, 244 acres at $150		36,600
TOTAL		$ 1,130,520
ANNUAL CHARGES:		
Interest at 4%		$ 45,221
Amortization (50 years—4%)		7,408
Maintenance		2,000
TOTAL		$ 54,629

PLAN B

CONSTRUCTION:		
Channel excavation and leveeing, 2,084,180 c.y. at 35c		$ 729,463
Clearing, 400 acres at $150		60,000
Seeding, 226 acres at $200		45,200
Drainage structures		85,000
		$ 919,663
Engineering and contingencies, 20%		183,932
		$ 1,103,595
Right of way, 372 acres at $200		74,400
TOTAL		$ 1,177,995

ANNUAL CHARGES:	
Interest at 4%	$ 47,120
Amortization (50 years—4%)	7,719
Maintenance	4,000
TOTAL	$ 58,839

PLAN C

CONSTRUCTION:	
Clearing channel, 51 acres at $125	$ 6,375
Clearing channel, 145 acres at $175	25,375
Cleaning 97,680 lineal feet of channel at 7c	6,838
	$ 38,588
Engineering and contingencies, 20%	6,350
TOTAL	$ 44,938
ANNUAL CHARGES:	
Interest at 4%	$ 1,798
Amortization (15 years—4%)	2,247
Maintenance	1,500
TOTAL	$ 5,545
Annual Benefits (See Paragraph 17 of this report)	$ 6,000
Ratio of annual benefits to annual charges	1.08 to 1

17. **Discussion.** Some 8000 acres of agricultural land lying along Rock Creek between the city of Morrison and the mouth are subject to damage from Rock Creek floods. The average annual crop and property damage is $27,000 and this is considered to be the maximum average annual benefit attainable. If the channel is allowed to continue at its present rate of deterioration, its carrying capacity will be progressively reduced and damaging floods will occur with increasing frequency.

Three plans have been considered for reducing flood damages. Plan A consists of channel improvement only, Plan B is a combination of channel improvement and levees and Plan C provides for cleaning and clearing of the existing channel.

Channel improvement, as considered under Plan A, would reduce the frequency of flooding to about once in five years. Since the annual charges are greatly in excess of the annual benefits, the plan is not economically justified.

By a combination of channel improvement and levees, as considered under Plan B, protection would be provided against growing season floods that could reasonably be expected to occur once in ten years. Since the annual charges are greatly in excess of the annual benefits, the plan is not economically justified.

It is estimated that cleaning and clearing, as considered under Plan C, would reduce by $6000 the average annual damage suffered by an area of about 1000 acres and this amount is considered to be the

average annual benefit for Plan C. The ratio of annual benefits to annual charges under this plan is 1.08 to 1.

18. **Conclusions.** Of the three plans studied, Plan C was the only one found to have economic justification. Execution of the work proposed under Plan C would not aggravate conditions elsewhere or disturb the present activities of the area.

19. **Recommendations.** It is recommended that Plan C be adopted for the reduction of flood damage along Rock Creek between Rock River and the Chicago and Northwestern Railway bridge near Morrison.

It is further recommended that the State of Illinois participate in this project to the extent of providing the entire first cost of the project exclusive of cost of right-of-way and any local expense incident to the necessary action by local interests.

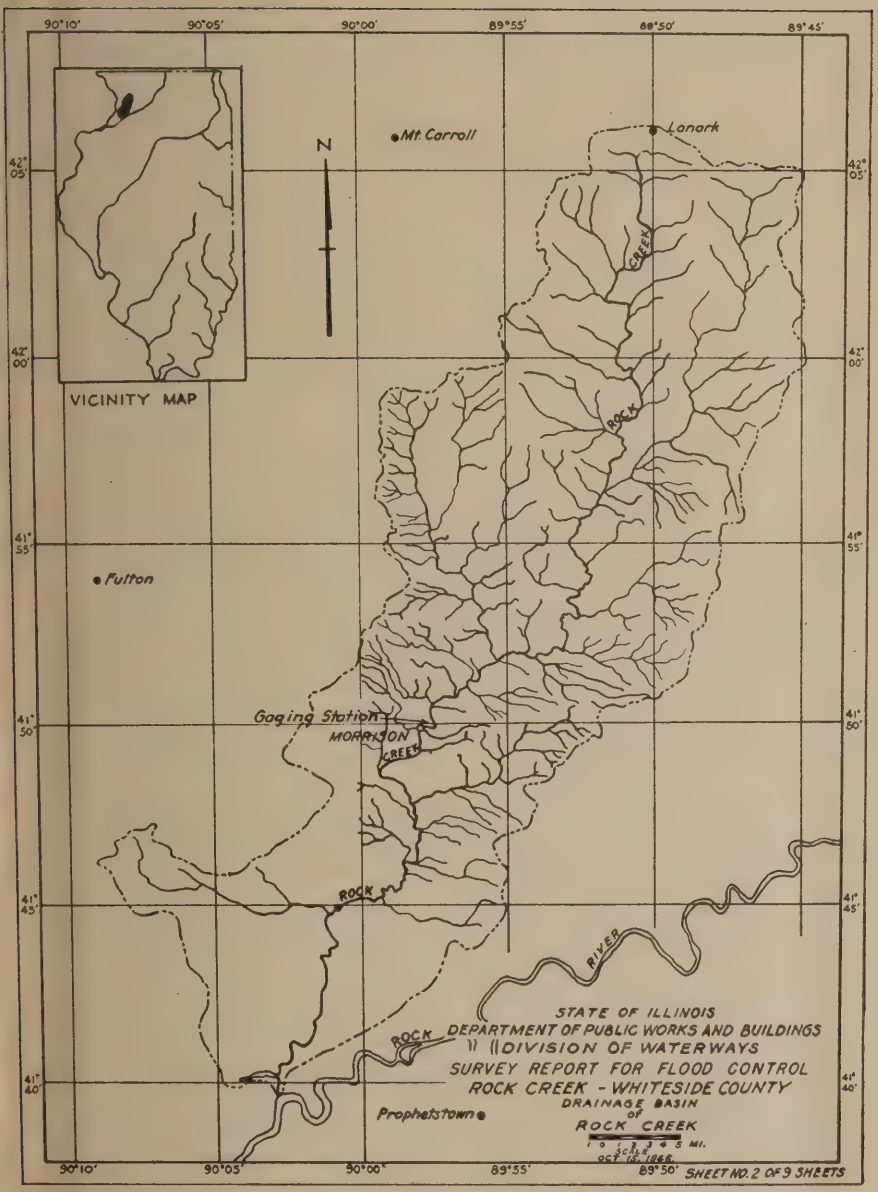
It is further recommended that such participation on the part of the State of Illinois be conditioned upon the execution of assurances satisfactory to the Director of the Department of Public Works and Buildings that local interests will:

a. Provide without cost to the State of Illinois all lands, easements and rights-of-way necessary for the construction of the project.

b. Hold and save the State of Illinois free from damages due to the construction of the project.

c. Maintain and operate the work after completion in accordance with regulations prescribed by the Director of the Department of Public Works and Buildings.

PLANS A&B
PROPOSED NEW CHANNEL
PLAN C
PLANS A&B
PROPOSED NEW CHANNEL
PLANS A&B
PROPOSED
NEW CHANNEL
C B N W Ry
Morrison
End of Improvement
ROCK CREEK
Union No. 1 Erie and Fenton
Drainage Ditch
C B & Q R R
Enterprise Drainage Ditch
Fenton
Danrock
C B & Q R R
Beginning of Improvement
ROCK CREEK
STATE OF ILLINOIS
DEPARTMENT OF PUBLIC WORKS AND BUILDINGS
DIVISION OF WATERWAYS
SURVEY REPORT FOR FLOOD CONTROL
ROCK CREEK — WHITESIDE COUNTY
INDEX MAP
DATE OCTOBER 15-1945
DESIGNED BY
SCALE
DRAWN BY
C Pemberton
DATE
FILE NO
CLASSIFICATION
REVISIONS
RECOMMENDED
PRINCIPAL ENGINEER
DATE
APPROVED
CHIEF ENGINEER
DATE
SHEET NO
1
OF 9 SHEETS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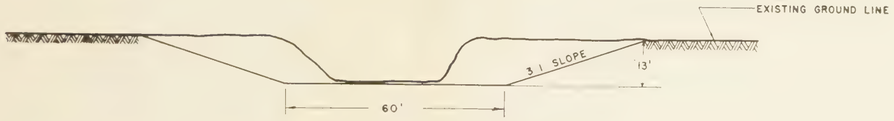
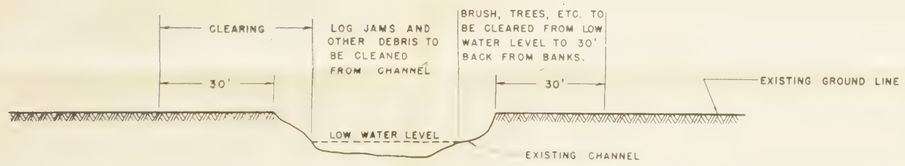
90°05'
90°00'
89°55'
89°50'
89°45'
42° 05'
42° 00'
41° 55'
41° 50'
41° 45'
41° 40'
N
Mt. Carroll
Lanark
CREEK
ROCK
VICINITY MAP
Fulton
Gaging Station
MORRISON
CREEK
ROCK
RIVER
ROCK
Prophetstown
STATE OF ILLINOIS
DEPARTMENT OF PUBLIC WORKS AND BUILDINGS
DIVISION OF WATERWAYS
SURVEY REPORT FOR FLOOD CONTROL
ROCK CREEK - WHITESIDE COUNTY
DRAINAGE BASIN
OF
ROCK CREEK
0 1 2 3 4 5 MI.
SCALE
OCT. 15, 1956.
SHEET NO. 2 OF 9 SHEETS

FROM STA. 0+00 TO STA. 726+70



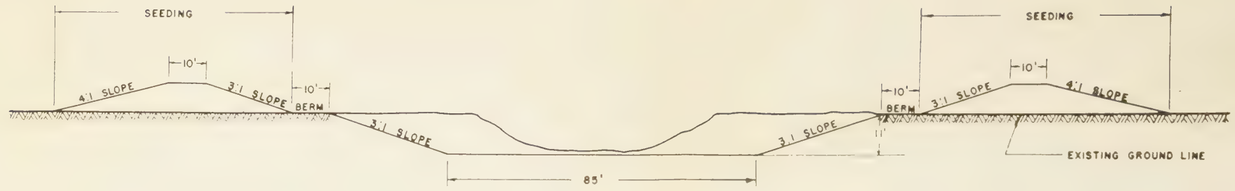
FROM STA. 726+70 TO STA. 952+80

TYPICAL SECTIONS—NEW CHANNEL
PLAN A
SCALE 1"=20'

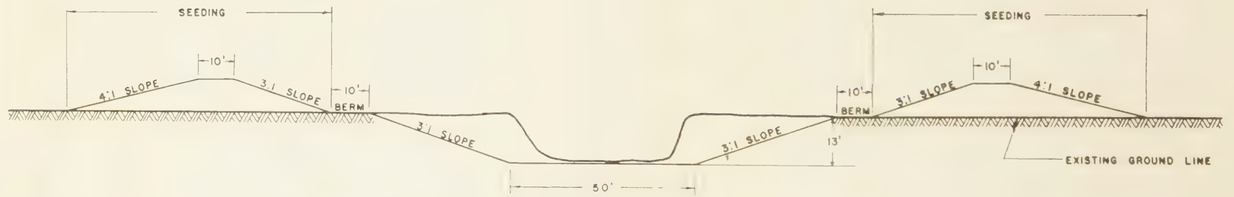

CLEARING
30'
LOG JAMS AND OTHER DEBRIS TO BE CLEANED FROM CHANNEL
BRUSH, TREES, ETC. TO BE CLEARED FROM LOW WATER LEVEL TO 30' BACK FROM BANKS.
30'
EXISTING GROUND LINE
LOW WATER LEVEL
EXISTING CHANNEL

FROM STA. 0+00 TO STA. 952+80

TYPICAL SECTION—EXISTING CHANNEL
PLAN C
SCALE 1" = 20'



FROM STA. 0+00 TO STA. 726+70



FROM STA. 726+70 TO STA. 952+80

TYPICAL SECTIONS—NEW CHANNEL
PLAN B
SCALE 1" = 20'

STATE OF ILLINOIS
DEPARTMENT OF PUBLIC WORKS AND BUILDINGS
DIVISION OF WATERWAYS

SURVEY REPORT FOR FLOOD CONTROL
ROCK CREEK — WHITESIDE COUNTY
LEVEES AND CHANNELS

DATE OCTOBER 15-1946 SCALE AS SHOWN

DESIGNED BY
DRAWN BY
CHECKED BY
REVISIONS

SUBMITTED C. Pemberton HYDRAULIC ENGINEER DATE
RECOMMENDED [illegible] PRINCIPAL ENGINEER DATE
APPROVED [illegible] CHIEF ENGINEER DATE

FILE NO.
CLASSIFICATION
SHEET NO 9 OF 9 SHEETS

UNIVERSITY OF ILLINOIS-URBANA
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